DETAILED ACTION

Claim Rejections - 35 USC § 112

1. Claim 62 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

2. Claim 62 recites the limitation "circuit" in the third line of the claim. There is insufficient antecedent basis for this limitation in the claim. For the purpose of advancing the prosecution of the present application the Examiner interprets "pressure of the working medium in the circuit" to refer to the pressure of the working medium in the reaction chamber.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Claims 35, 37-42 and 47-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,419,815 to Chambers ("Chambers") in view of US Patent 5,238,547 to Tsubouchi et al. ("Tsubouchi") and US Patent 4,182,662 to Hart ("Hart").

6. In re Claim 35, with reference to figure 1 below, Chambers discloses a device for converting energy, comprising a gas generator for generating a Brown's gas (*see* Abstract), the gas generator comprising a reaction chamber (111), electrodes (105a, 105b) disposed in the reaction chamber, wherein the reaction chamber (111) is of a rotationally symmetrical shape with respect to an axis (*see* col. 3, lines 29-35).

Chambers

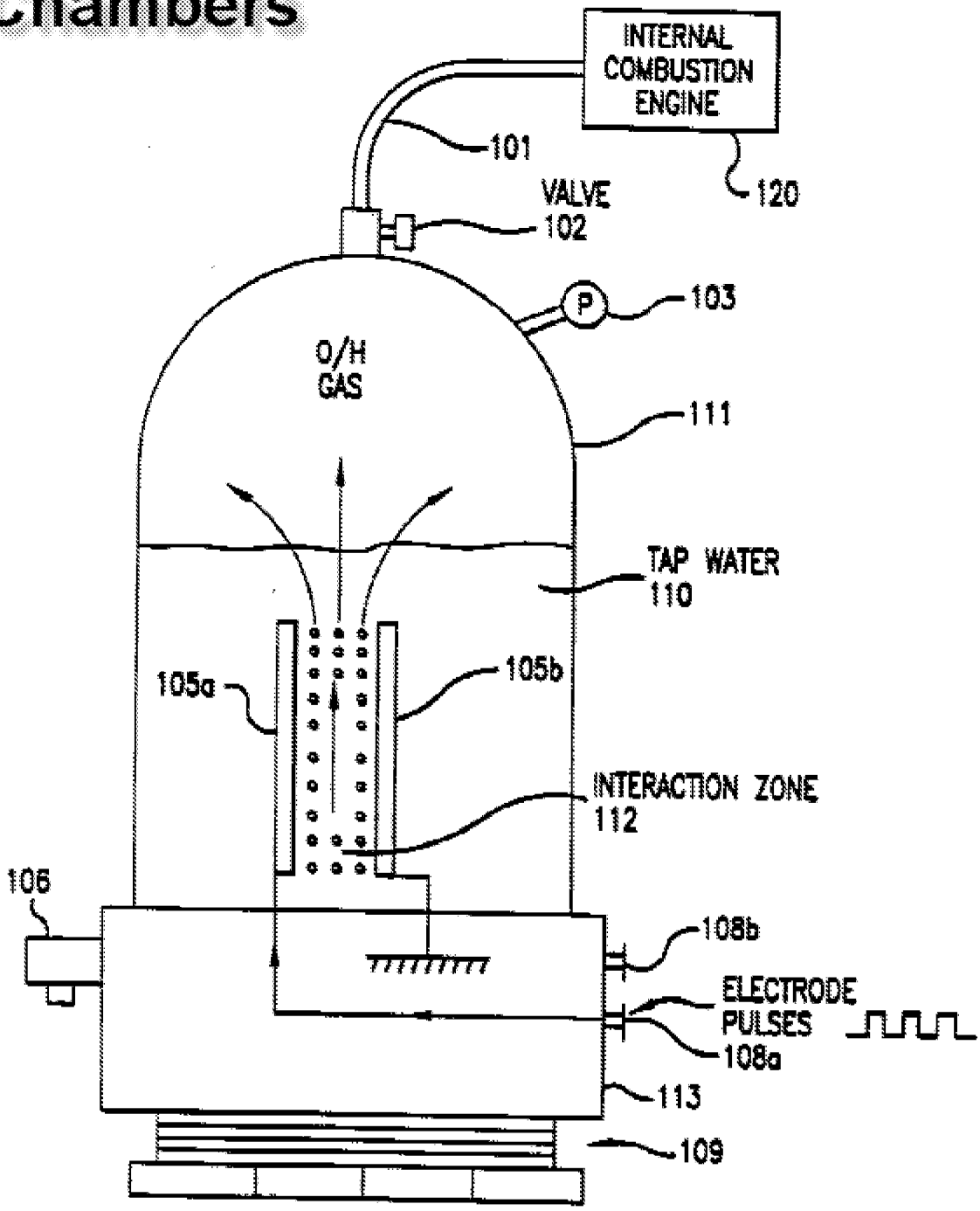


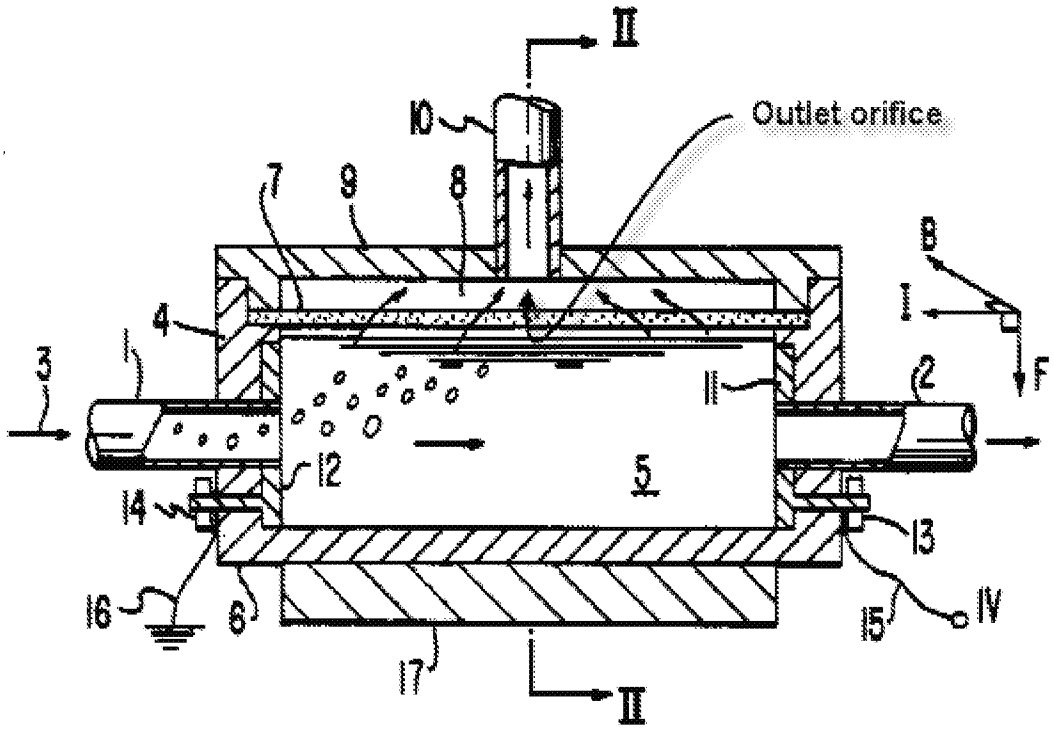
FIG. 1

7. However, Chambers does not disclose at least certain regions of inner boundary surfaces of the reaction chamber in the region of a jacket of the reaction chamber are formed by inner electrode surfaces of the electrodes, the inner boundary surfaces in the region of the jacket merging constantly with the inner electrode surfaces, and a rotor having a rotation axis is disposed in the gas generator, the rotation axis extending coaxially with the axis of the reaction chamber.

8. Nonetheless, with reference to figure 1 below, Tsubouchi teaches an electrolysis chamber wherein electrodes (11, 12) are disposed in the reaction chamber, and at least certain regions of inner boundary surfaces of the reaction chamber in the region of a jacket of the reaction chamber are formed by inner electrode surfaces of the electrodes, the inner boundary surfaces in the region of the jacket merging constantly with the inner electrode surfaces (*see* col. 3, lines 26-30).

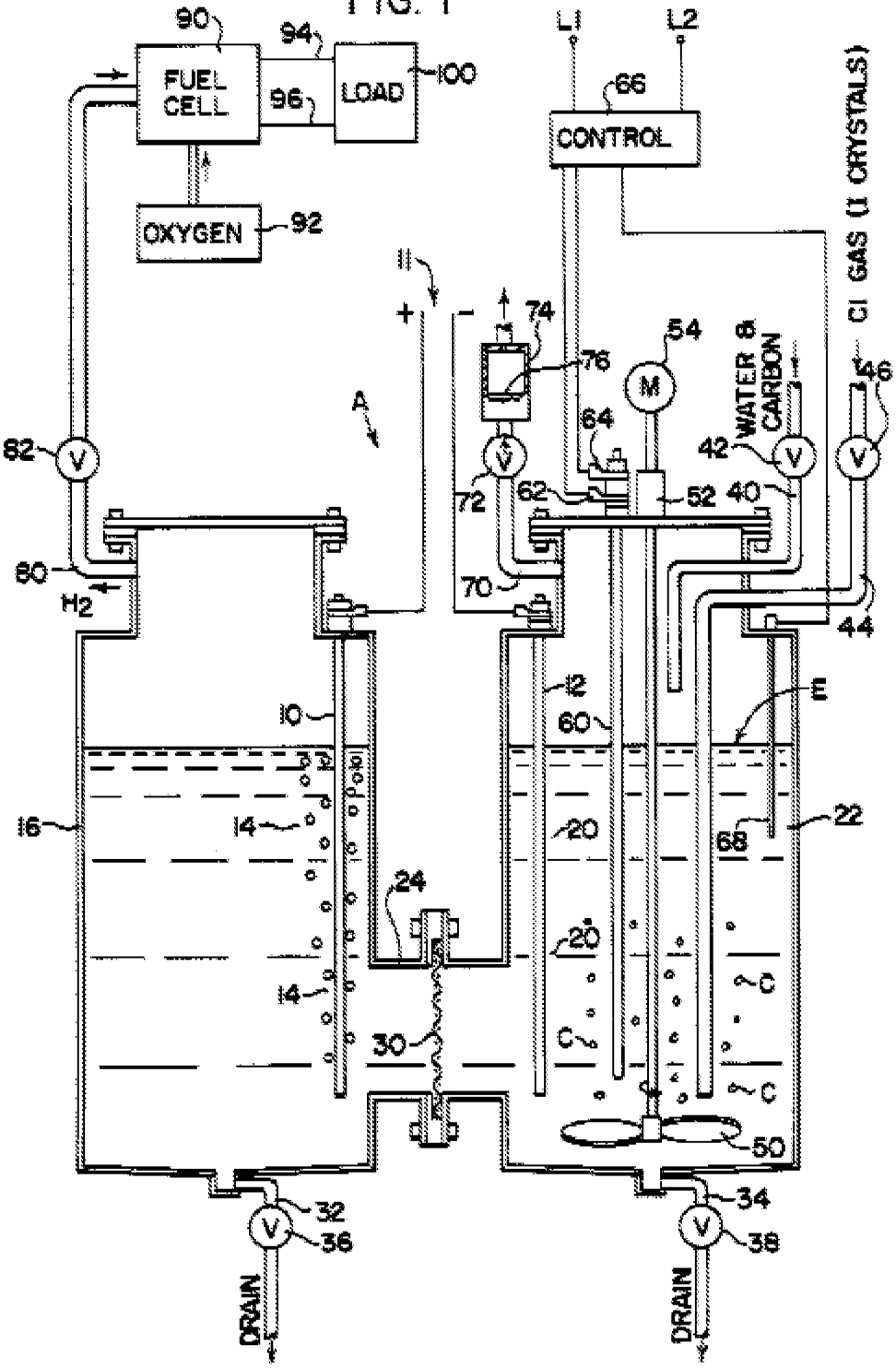
Tsubouchi

FIG. 1



9. And, with reference to figure 1 below, Hart teaches a method and apparatus for forming hydrogen by electrolysis wherein a rotor (50) having a rotation axis is disposed in the gas generator, the rotation axis extending coaxially with the axis of the reaction chamber (22).

FIG. 1


90
94
FUEL CELL
96
LOAD
100
OXYGEN
92
L1
L2
66
CONTROL
CI GAS (I CRYSTALS)
74
76
54
M
WATER & CARBON
46
42
64
82
72
62
52
40
60
70
H_2
44
12
10
60
E
16
14
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22
68
24
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14
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50
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DRAIN

10. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chambers by adding a rotor having a rotation axis disposed in the gas generator, the rotation axis extending coaxially with the axis of the reaction chamber as taught by Hart, for the purpose of enhancing the electrolysis process by ensuring that all of the fluid medium is exposed to the electric field due to the continuous circulation and also to assist in dislodging any gas bubbles clinging to an electrode surface. Furthermore, it would have been obvious to one having ordinary skill in the art to have at least certain regions of the inner boundary surfaces of the reaction chamber in the region of a jacket of the reaction chamber formed by inner electrode surfaces of the electrodes, the inner boundary surfaces in the region of the jacket merging constantly with the inner electrode surfaces as taught by Tsubouchi, since such a modification would also compliment the circulation pattern created by said rotor by avoiding any obstruction to the fluid medium circulation pattern while still providing the necessary electrode surfaces and electrical current for the production of a Brown's Gas via the electrolysis process. (*See also* Chambers, col. 4, lines 31-32).

11. In re Claim 37, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations except for wherein the rotor is designed to generate a rotation with an angular velocity in a range of from 10 sec^{-1} to 25 sec^{-1}.

12. Nonetheless, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chambers by incorporating a rotor and motor which generate a rotation with an angular velocity in a range of from 10 sec^{-1} to 25 sec^{-1}, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

13. In re Claim 38, with reference to figures 1 and 3 of Chambers, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations including further comprising a base plate (113) and cover plate (301) closing off the reaction chamber (111), and an outlet orifice disposed in the cover plate coaxially with the axis of the reaction chamber (as evidenced by valve 102 and conduit 101). (*See also* Chambers, col. 4, lines 25-30).

14. In re Claim 39, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations including wherein the outlet orifice is a suction lance (101) which is displaceable parallel with the direction of the axis of the reaction chamber.

15. In re Claim 41, with reference to figure 1 of Hart above, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations including wherein a phase separation device (74) is provided in the suction lance (70).

16. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Chambers to include a phase separation device as taught by Hart, for the purpose of purifying the gas outlet stream.

17. In re Claim 40, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations except for wherein the outlet orifice is a suction funnel.

18. Nonetheless, it would have been an obvious matter of design choice to provide an outlet orifice in the shape of a suction funnel, since applicant has not disclosed that such a shape solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with the outlet orifice disclosed in Chambers.

19. In re Claim 42, with reference to figure 1 of Chambers above, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations including wherein a throttle valve (102)

is disposed in a line (101) connected to an outlet orifice, and the reaction chamber (111) is a pressure vessel (*see* Chambers, col. 2, lines 11-12).

20. In re Claim 47, with reference to figure 1 of Hart above, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations including wherein the gas generator comprises an IR source (60).

21. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Chambers to include an IR source as taught by Hart, for the purpose of heating the fluid medium to an optimum temperature thereby enhancing the electrolysis process (*see* Hart, col. 5, lines 60-65).

22. In re Claim 48, with reference to figure 1 of Tsubouchi above, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations including wherein the gas generator comprises a magnet (17).

23. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Chambers to include a magnet as taught by Hart, for the purpose of enhancing the separation of the liquid medium and the gas thereby enhancing the electrolysis process (*see* Tsubouchi, col. 2, lines 23-30).

24. In re Claim 49, with reference to figure 1 of Tsubouchi above, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations including wherein a magnetic field direction (F) of the magnet (17) in the region of the axis of the reaction chamber (5) is oriented anti-parallel with respect to a direction of an angular velocity of the rotor (*see* Tsubouchi, col. 3, lines 42-57).

25. Claims 36 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chambers in view of Tsubouchi and Hart as applied to claim 35 above, and further in view of US Patent Application Publication 2002/0096648 to Kaiser et al. ("Kaiser").

26. In re Claim 36, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations except for wherein at least one inlet connector for a working medium extends into the jacket tangentially with respect to the jacket.

27. Nonetheless, with reference to figures 2 and 4b below, Kaiser teaches a cylindrical reaction chamber with a rotor (23) wherein at least one inlet connector (13) for a working medium extends into the jacket (24) tangentially with respect to the jacket.

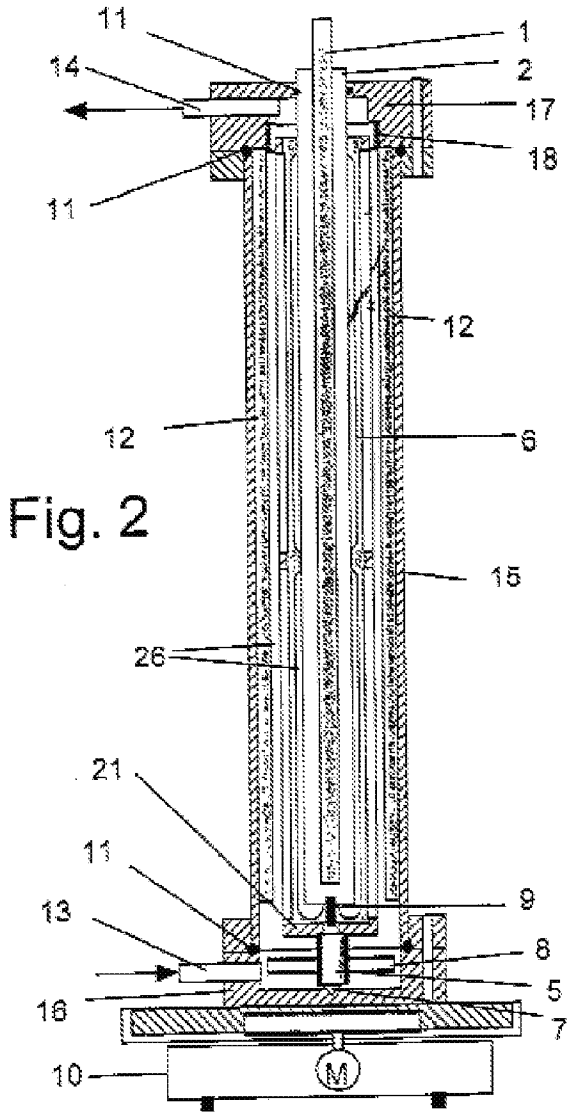

Fig. 2

Kaiser

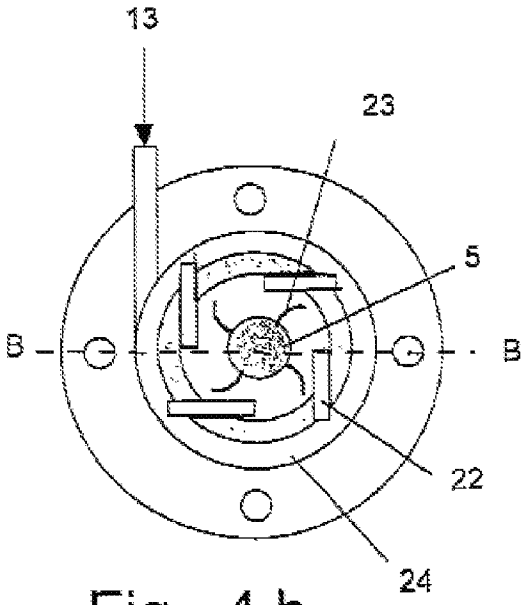

Fig. 4 b

28. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chambers wherein at least one inlet connector for a working medium extends into the jacket tangentially with respect to the jacket as taught by Kaiser, since such a modification would compliment the fluid medium circulation pattern created by the rotor.

29. In re Claim 50, with reference to figure 1 of Chambers above, Chambers in view of Tsubouchi and Hart and Kaiser discloses all of the claim limitations including comprising a pressure vessel (111) for the working medium. (*See* Chambers, col. 2, lines 11-12).

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30. Claims 43-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chambers in view of Tsubouchi and Hart as applied to claim 35 above, and further in view of US Patent 5,176,809 to Simuni ("Simuni").

31. In re Claims 43-45, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations except for wherein the gas generator comprises an acoustic source and wherein the acoustic source is designed to generate sound at a frequency in a range of from 25 kHz to 55 kHz and wherein the acoustic source extends coaxially with the axis of the reaction chamber.

32. Nonetheless, with reference to figure 1 below, Simuni teaches a device for producing hydrogen via electrolysis and ultrasonic waves wherein the gas generator comprises an acoustic source (12) and wherein the acoustic source (12) extends coaxially with the axis of the reaction chamber.

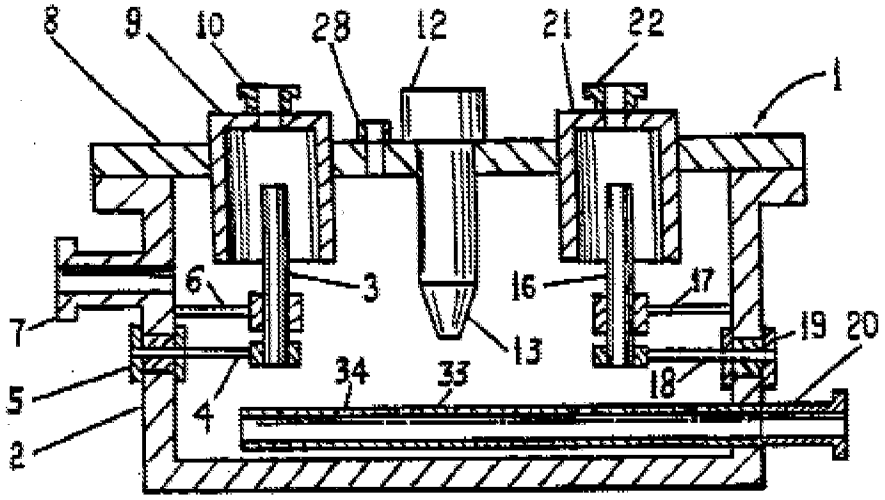

Fig. 1 Simuni

33. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chambers by incorporating an acoustic source located coaxially with the axis of the reaction chamber as taught by Simuni, since such a modification would increase the device's efficiency of Hydrogen production (*see* Simuni, col. 3, lines 1-6).

34. Regarding wherein the acoustic source is designed to generate sound at a frequency in a range of from 25 kHz to 55 kHz. It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate an acoustic source designed to generate sound at a frequency in a range of from 25 kHz to 55 kHz, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller,* 105 USPQ 233.

35. In re Claim 46, with reference to figure 1 of Chambers above, Chambers in view of Tsubouchi, Hart and Simuni discloses all of the claim limitations including wherein at least a

part-region of the inner boundary surface of the reaction chamber is shaped as a reflector for concentrating the sound (*with reference to* the dome shaped reaction chamber).

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36. Claims 51-55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chambers in view of Tsubouchi and Hart as applied to claim 35 above, and further in view of US Patent Application Publication 2003/0138688 to Hattori et al. ("Hattori").

37. In re Claims 51-55, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations except for being combined with a heating device comprising a heat generator, an interior of the heat generator being provided with a sintered material and wherein the gas generator, the heat generator, a heat exchanger, a pressure vessel for a working medium and a pump are connected to one another to form a closed circuit for the working medium and wherein the heat exchanger has a fan for feeding heat away from the heat exchanger and wherein a control system is provided for controlling the operating mode and wherein the control system is designed to run an automatic control.

38. Nonetheless, with reference to figure 1 below, Hattori teaches a fuel cell power generation system with a heating device comprising a heat generator (40), and wherein the gas generator (30), the heat generator (40), a heat exchanger (44), a pressure vessel (52) for a working medium and a pump (51) are connected to one another to form a closed circuit for the working medium and wherein the heat exchanger has a fan (41) for feeding heat away from the heat exchanger and wherein a control system (60) is provided for controlling the operating mode and wherein the control system is designed to run an automatic control (*see* pg. 2, last sentence of paragraph 0032).

39. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chambers by incorporating its gas generation features with a complete power system as taught by Hattori, since such a modification would make use of the power generation potential of the hydrogen gas generated by Chambers in a productive an environmentally friendly fashion (*see* Chambers, col. 8, lines 16-23).

40. Regarding an interior of the heat generator being provided with a sintered material; it is old and well known in the art that fuel cells are commonly constructed of sintered materials (*see for example*: US Patent 5356731).

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41. Claims 56-57, 59, 61-62 and 66-67 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,419,815 to Chambers ("Chambers") in view of US Patent 5,238,547 to Tsubouchi et al. ("Tsubouchi") and US Patent 4,182,662 to Hart ("Hart").

42. In re Claim 56, with reference to figure 1 of Chambers above, Chambers discloses a method of converting energy using a Brown gas (*see* Abstract), wherein a working medium (110) is fed into a reaction chamber (111) of a rotationally symmetrical shape with respect to an axis, and an electric field is applied between electrodes (105a, 105b) disposed in the reaction chamber (111), electric field direction being oriented perpendicularly to the axis of the reaction chamber (inherent), the Brown gas formed in the region of the axis of the reaction chamber (112) is fed out (101, 102) of the reaction chamber and the Brown gas is recombined to form water (120; *see also* col. 3, line 67 through col. 4, line 8).

43. However, Chambers does not disclose inner surfaces of the electrodes constituting at least certain regions of boundary surfaces of the reaction chamber, and that the reaction medium

is displaced in rotation, and a rotation axis of the reaction medium extending coaxially with the axis of the reaction chamber.

44. Nonetheless, with reference to figure 1 above, Tsubouchi teaches an electrolysis chamber wherein electrodes (11, 12) are disposed in the reaction chamber, and inner surfaces of the electrodes (11, 12) constituting at least certain regions of boundary surfaces (4) of the reaction chamber (5), the inner boundary surfaces in the region of the jacket merging constantly with the inner electrode surfaces (*see* col. 3, lines 26-30).

45. And, with reference to figure 1 above, Hart teaches a method and apparatus for forming hydrogen by electrolysis wherein the reaction medium is displaced in rotation (as evidenced by rotor 50), and a rotation axis of the reaction medium extending coaxially with the axis of the reaction chamber (22).

46. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chambers by causing the reaction medium to be displaced in rotation, and a rotation axis of the reaction medium extending coaxially with the axis of the reaction chamber as taught by Hart, for the purpose of enhancing the electrolysis process by ensuring that all of the fluid medium is exposed to the electric field due to the continuous circulation and also to assist in dislodging any gas bubbles clinging to an electrode surface. Furthermore, it would have been obvious to one having ordinary skill in the art to have inner surfaces of the electrodes constituting at least certain regions of boundary surfaces of the reaction chamber as taught by Tsubouchi, since such a modification would also compliment the circulation pattern created by said rotor by avoiding any obstruction to the fluid medium circulation pattern while still providing the necessary electrode surfaces and electrical current for

the production of a Brown's Gas via the electrolysis process. (*See also* Chambers, col. 4, lines 31-32).

47. In re Claim 57, with reference to figure 1 of Tsubouchi above, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations including wherein the reaction medium and/or Brown gas in the reaction chamber is exposed to a magnetic field (17), and a magnetic induction (F) in the region of the axis of the reaction chamber is oriented anti-parallel with respect to the direction of the angular velocity of the rotation. (*See also* Claims 48-49 above).

48. In re Claim 59, with reference to figure 1 of Hart above, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations including wherein the reaction medium and/or Brown gas is exposed to IR radiation (60) in the reaction chamber (22). (*See also* Claim 47 above).

49. In re Claim 61, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations except for wherein the angular velocity of the rotation of the reaction medium in the reaction chamber is periodically varied.

50. Nonetheless, it would have been obvious to one having ordinary skill in the art at the time the invention was made to periodically vary the angular velocity of the rotation of the reaction medium in the reaction chamber since it was known in the art that the electrolysis process could be increased or decreased depending on the length of time that a given volume of a reaction medium is exposed to an electric field.

51. In re Claim 62, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations including wherein a pressure of the working medium in the circuit is periodically varied (106; *see also* Chambers, col. 3, lines 39-47).

52. In re Claim 66, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations including wherein the recombination of the Brown gas takes place in a heat generator (120) and the heat generated as a result is fed away with the reaction medium (*see* col. 3, line 67 through col. 4, line 8).

53. In re Claim 67, with reference to figure 1 of Chambers above, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations except for wherein the Brown gas is fed through a sintered material in the heat generator.

54. Nonetheless, Chambers would have suggested, to one skilled in the art at the time of the invention, the use of said Brown gas with a fuel cell (*i.e.* a heat generator) and it is old and well known in the art that fuel cells are commonly constructed of sintered materials (*see for example*: US Patent 5356731).

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55. Claims 58, 63 and 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chambers in view of Tsubouchi and Hart as applied to claim 56 above, and further in view of Simuni.

56. In re Claim 58, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations except for wherein the reaction medium and/or Brown gas is exposed to acoustic energy in the reaction chamber.

57. Nonetheless, with reference to figure 1 above, Simuni teaches a device for producing hydrogen via electrolysis and ultrasonic waves wherein the gas generator comprises an acoustic source (12) and wherein the reaction medium and/or Brown gas is exposed to acoustic energy in the reaction chamber (2).

58. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chambers wherein the reaction medium and/or Brown gas is exposed to acoustic energy in the reaction chamber as taught by Simuni, since such a modification would increase the device's efficiency of Hydrogen production (*see* Simuni, col. 3, lines 1-6).

59. In re Claim 63, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations except for wherein an acoustic intensity of an acoustic source in the reaction chamber is periodically varied.

60. Nonetheless, with reference to figure 2 below, Simuni teaches a device for producing hydrogen via electrolysis and ultrasonic waves wherein the gas generator (1) comprises an acoustic source (12) and wherein the acoustic source (12) is connected to a power source (15).

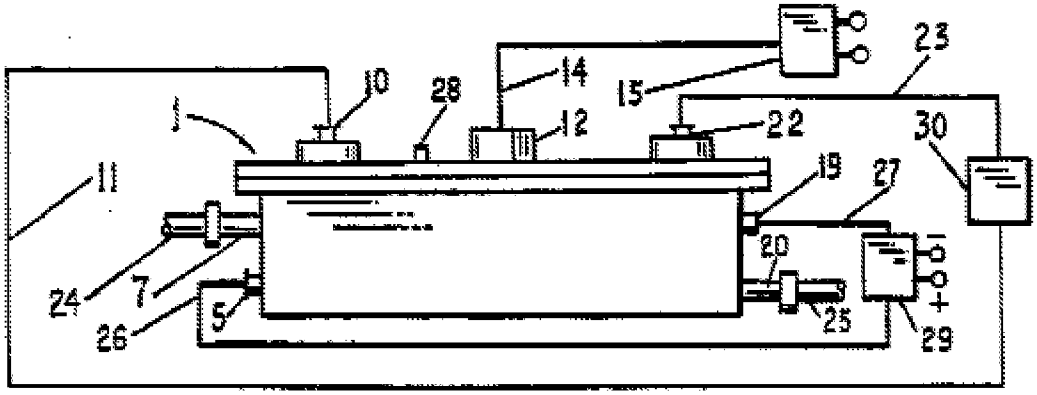

FIG -2-

61. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to periodically vary the acoustic intensity of an acoustic source in the reaction chamber since it was known in the art that the electrolysis process could be increased or

decreased depending on the amount of agitation that a given volume of a reaction medium is exposed to (*see* Simuni, col. 3, lines 1-6).

62. In re Claim 65, Chambers in view of Tsubouchi, Hart and Simuni discloses all of the claim limitations except for wherein the value of a frequency of the periodic variation in the pressure of the working medium and/or the acoustic intensity of the acoustic source and/or the angular velocity is selected from a range of between 0.1 Hz and 10 Hz.

63. Nonetheless, it would have been obvious to one having ordinary skill in the art at the time the invention was made to select the frequency of the periodic variation in the pressure of the working medium and/or the acoustic intensity of the acoustic source and/or the angular velocity from a range of between 0.1 Hz and 10 Hz, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233.

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64. Claim 60 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chambers in view of Tsubouchi and Hart as applied to claim 56 above, and further in view of US Patent 6,610,193 to Schmitman ("Schmitman").

65. In re Claim 60, Chambers in view of Tsubouchi and Hart discloses all of the claim limitations except for wherein the reaction medium and/or Brown gas are conveyed in a closed circuit.

66. Nonetheless, with reference to figure 2 below, Schmitman teaches a system and method for the production and use of hydrogen wherein the reaction medium and/or Brown gas are conveyed in a closed circuit (*see* col. 6, lines 26-40).

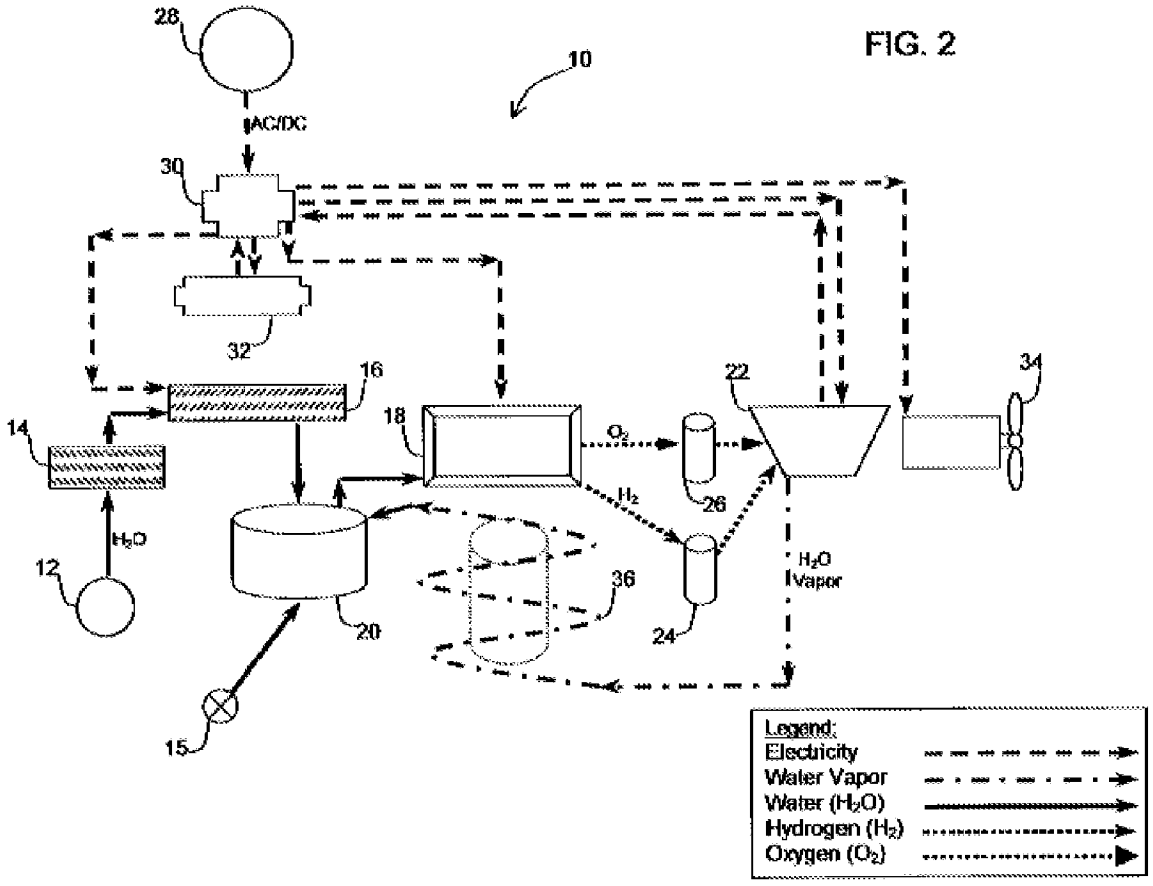

FIG. 2

67. Therefore, It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chambers wherein the reaction medium and/or Brown gas are conveyed in a closed circuit as taught by Schmitman, since such a modification would provide a highly efficient energy producing system wherein a working fluid is constantly phase shifted without any appreciable waste. The Examiner notes that such a closed circuit resembles a refrigeration cycle.

Allowable Subject Matter

68. Claim 64 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

69. The following is a statement of reasons for the indication of allowable subject matter: The specific limitation of "the periodic variation in the pressure of the working medium takes place in an opposite phase from the periodic variation of the acoustic intensity of the acoustic source" in the combination as claimed in claim 64 is not anticipated or made obvious by the prior art of record in the examiner's opinion. The prior art fails to teach or suggest the specific limitation of an opposite phase relationship between the working medium pressure and the acoustic intensity.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Please see form PTO-892 (Notice of References Cited) attached to, or included with, this Office Action.

70. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period

will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JORGE PEREIRO whose telephone number is (571) 270-3932. The examiner can normally be reached on Mon.-Fri. 9:00 am - 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Rinehart can be reached on 571-272-4881. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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